



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION II

DATE:

SUBJECT: Removal Site Evaluation for the 738 Upper Mountain Road Site, Lewiston, New York

FROM: Eric M. Daly, On-Scene Coordinator
Response Prevention Branch

TO: Joseph D. Rotola, Chief
Removal Action Branch

Introduction

The United States Environmental Protection Agency (EPA) Region II Removal Action Branch (RAB) was requested to conduct a Removal Site Evaluation (RSE) at the 738 Upper Mountain Road Site (Site) by the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH).

In July 1985, members of the Radiological Survey Activities (RSA) group at Oak Ridge National Laboratory (ORNL) performed radiological surveys of properties throughout Niagara County. The results of the surveys were recorded in a November 1986 report, which specifically documented elevated gamma exposure rates at the driveway of the Site, among other sites in Niagara Falls and Lewiston, New York. The NYSDEC and NYSDOH referred 738 Upper Mountain Road to EPA on July 21, 2013 for further assessment.

The EPA Pre-Remedial Section (PRS) screened the Site in December 2013 and as of May 2014 recommended a "No Further Remedial Action Planned" (NFRAP) determination. The NFRAP determination signifies that no additional remedial steps will be taken to list the Site on the National Priorities List (NPL) unless new information warranting further Superfund consideration or conditions not previously known to EPA regarding the Site are disclosed. The NYSDEC and NYSDOH requested RAB to assess the Site for a potential Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) removal action. In response to this, RAB initiated a RSE to determine Site eligibility.

CONCURRENCES

Name: 738 Upper Mountain Road Initial: Date: 06/11/2018 Filename

Symbol	ERRD-RPB	ERRD-RPB	ERRD-RAB						
Surname	Daly	Mosher	Rotola						
Date	06-11-18	6/12/18	6/12/18						



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Site Description and Background

The Site (EPA ID No. NYN000206697) consists of two properties, Parcel #: 115.08-1-26 and Parcel #: 115.08-1-27 located in Lewiston, NY. Parcel #: 115.08-1-26 has a residential home located on the property. This property does not contain contamination as per historical data. Parcel #: 115.08-1-27 is a vacant property, which is owned by Talarico Bros. Building Corp (TBBC) and covers approximately 10.2 acres. An area of observed contamination, approximately 100 square meters, is located on what was historically used as an access road to the southern portion of the TBBC property (see Attachment A). Presently, this access road is used as a driveway by the resident of Parcel #: 115.08-1-26. The Site is bordered to the north by Upper Mountain Road, residential properties and a wooded area; to the east and west by residential properties; and to the south by a wooded area.

In July 1985, members of the RASA group at ORNL performed a radiological survey of the Site, which documented a maximum gamma exposure rate of 710 microrentgens per hour ($\mu\text{R/hr}$). The area with these readings was approximately 10 feet wide by 59 feet in length, and located along a ditch and gravel residential driveway. The results of the survey were documented in a November 1986 report, which stated that the gamma radiation anomaly at the Site was associated with a phosphate slag material. Biased surface soil samples collected during the survey indicated the presence of radium-226 (Ra-226), uranium-238 (U-238), and thorium-232 (Th-232) at the Site. The contaminated soil and rock samples collected had approximately equal concentrations of Ra-226 and U-238, which suggested to the investigators that the rocks probably originated from a singular source. The origin of the material was unknown; the report postulated that its source was some type of mineral extraction activity in the Niagara Falls area. The report stated that the anomaly at the Site was not related to materials connected with the Niagara Falls Storage Site (NFSS), including materials that were transported to NFSS.

During a reconnaissance performed by the NYSDOH and NYSDEC on July 9, 2013, screening activities showed radiation levels at 300 $\mu\text{R/hr}$ with a hand-held pressurized ion chamber. The background readings for this Site were approximately 10 $\mu\text{R/hr}$. Surveying with the sodium iodide 2x2 scintillation detector, the highest readings ranged from 105,000-110,000 counts per minute (CPM), with the estimated background readings at the Site being 9,000 counts per minute (CPM). Both of the elevated measurements were obtained at the end of the driveway adjacent to Upper Mountain Road.

Previous Work Relevant to this Removal Site Evaluation

PRS initiated a preliminary assessment (PA) and site inspection (SI) to assess whether the Site posed a threat to human health and the environment. An on-site reconnaissance was conducted on September 10, 2013 to perform a gamma radiation screening. Elevated gamma readings were observed toward the end of the driveway close to the road in an approximately 45-foot by 45-foot gravel area. The readings in the area of elevated gamma radiation ranged from background levels (approximately 9,000 CPM) to greater than 300,000 CPM.

On December 12, 2013, PRS and EPA contractor (Weston Solutions, Inc.) personnel collected a total of nine soil samples (including one environmental duplicate sample) and two slag samples



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from the Site. Soil samples were also collected from two locations suspected to be outside the influence of the observed contamination to document background conditions. At each location, soil samples were either collected directly beneath slag material or, at locations where a radioactive layer was not present, at the equivalent depth interval. The slag samples consisted of pulverized silty sand with rocks, cobbles, and gravel (i.e., radioactive waste material mixture) rather than singular pieces of slag.

The soil, slag, and aqueous rinsate blank samples were analyzed by Test America Laboratories for Target Analyte List metals analyses, including mercury; isotopic thorium, isotopic uranium and Radium-226 by alpha spectroscopy; and other radionuclides by gamma spectroscopy. Analytical results indicate concentrations of radionuclides found in the slag and soil to be higher than at background conditions (Attachment C: Sample Point UMR001-S001).

On May 1 and 2, 2014, PRS and Weston Solutions, Inc. personnel collected radon and thoron concentration measurements from locations on and in the vicinity of the Site. These measurements were collected with RAD7 radon detectors at the selected locations in background areas, above the source material, and off the source area. The radon and thoron measurements were collected at heights of one meter above the ground surface. There were no radon or thoron concentrations that exceeded the site-specific background.

Based on the PA and SI results, a Hazardous Ranking System (HRS) score was calculated. The calculated HRS score for the Site was less than 28.5 and, as a result, the Site did not qualify for the NPL. The Site was referred to RAB for a determination as to whether the Site warranted a CERCLA removal action.

RAB and an EPA risk assessor utilized the Pre-Remedial Data Site files, which included a Pre-Comprehensive Environmental Response, Compensation and Liability Information System Screening Form for the Site, as well as historic city directories, Sanborn maps, and analytical data collected from the Site, to conduct a preliminary RSE. In addition, an internet search for historic articles, maps, and photographs was conducted, and historic aerial photographs and online Erie County property records were reviewed. In June 2015, it was determined that conditions at the Site did not meet the requirements of Section 300.425(b) of the National Contingency Plan for the undertaking of a CERCLA removal action.

On September 23, 2016, RPB OSC was assigned as the lead for the Site to conduct a reassessment of the removal eligibility with the collection of additional field data. The reassessment utilized EPA's Preliminary Remediation Goals (PRG) Calculator. PRG calculations were performed by EPA Environmental Response Team (ERT) Health Physicist to determine whether the Site warranted a CERCLA removal action.

On October 25, 2016, EPA Response and Prevention Branch (RPB) and Weston Solutions, Inc. personnel performed a gamma survey at the Site (see Attachment B). The highest gamma reading recorded was approximately 462 $\mu\text{R/hr}$ in comparison to a background reading of approximately 10 $\mu\text{R/hr}$.



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On November 18, 2016, RPB and Weston Solutions, Inc. conducted soil sampling at 738 UMR Site at several locations on the Site (see Attachment C).

On December 06, 2016, the soil samples collected were analyzed on-site with a High-Purity Germanium (HPGe) Detector. Once completed, the samples were shipped to a third-party fixed analytical laboratory for analysis for isotopic Uranium and isotopic Thorium by alpha spectroscopy, 21 day in-growth for Ra-226, Uranium-238 decay chain radionuclides, and Thorium-232 decay chain radionuclides by gamma spectroscopy. On February 23, 2017, the preliminary soil sample results from the fixed analytical laboratory were received (see Attachment D).

On August 11, 2017, RPB and Weston Solutions, Inc. conducted an indoor gamma survey of the home located on the Site. There were no elevated gamma readings identified above background. A radon specialist placed radon canisters throughout the home.

On August 18, 2017, the radon laboratory results were received indicating that radon levels in the building tested were below the EPA action level of 4.0 pCi/l. Mitigation was not recommended under the existing conditions.

The focus of this RSE was placed on utilizing analytical data from soil samples collected as part of the assessment in November 2016, the gamma survey and radon sampling results, and the PRS assessment data.

Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

A variety of radionuclides, including radium, thorium and uranium, have been identified at the Site near the end of the driveway at levels higher than at background conditions. Radiological substances are listed in 40 CFR 302.4, List of Hazardous Substances and Reportable Quantities, Attachment B – Radionuclides. The statutory source for designating radionuclides as a hazardous substance under Section 102(a) of CERCLA, 42 U.S.C. § 9602(a), is Section 112 of the Clean Air Act, 42 U.S.C. § 7412.

Threats to Public Health or Welfare

Based on the site-specific assumptions developed in the *Risk Assessment of 738 Upper Mountain Road for Removal Action*, EPA-ERT, November 13, 2017 (see Attachment H) and the PRG Calculator results, the total human health risk of both Th-232 and U-238 is 8.26×10^{-6} . As a conservative assessment, the overall scenario for the risk calculation included both adults and children living on and near the contamination. The assumption is that the child turns into the adult and lives on the property for a total of 26 years, where the child spends 6 years on-site and the adult spends 20 years. In this assessment, the child becomes the adult after 6 years and continues to live on the site for 20 more years. Both adult and child spend 24 hours per day for 350 days per year exposed to the contaminant. Based on this very conservative assessment the human health risk for Th-232 and U-238 and their associated progeny identified at the Site is within EPA's acceptable risk range of 1×10^{-6} (1 in 1,000,000) to 1×10^{-4} (1 in 10,000).



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Threats to the Environment

At this time there is no information to indicate that the Site is currently having an acute impact to sensitive environments or natural resources near the Site.

Conclusion

Despite the presence of radiological material in the soil/rock driveway utilized by the resident at the Site, the results of the EPA radiological assessment are within EPA's acceptable risk range. Conditions at the Site do not meet the criteria for a CERCLA removal action under 40 CFR §300.415(b)(2) at this time. No additional assessment or sampling activities are planned.



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Attachment A:

Property Maps showing the estimated surface area of the property and the surface area for the contamination



Property Perimeter

Contaminant Perimeter



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Attachment C: Soil Sample Locations





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Attachment D: Highest Soil Sample Concentrations

Radioisotope	Analytical Data RST Data
	pCi/g
Actinium-228 (Ac-228)	NA
Bismuth-212 (Bi-212)	244.51
Cesium-137 (Cs-137)	0.489
Lead-212 (Pb-212)	232.95
Potassium-40 (K-40)	29.895
Protactinium-234M	32.995
Radium-226* (Ra-226)	6.575
Radium-228 (Ra-228)	221.46
Thallium-208 (Tl-208)	78.922
Thorium-228 (Th-228)	323.85
Thorium-234 (Th-234)	22.436
Uranium-235 (U-235)	2.401
Thorium-228 (Th-228)	74.7
Thorium-230 (Th-230)	12.2
Thorium-232 (Th-232)	59.1
U-233/234	23.5
U-235/236	1.68
Uranium-238 (U-238)	24.2

Ra-226* (21 days ingrowth)

Yellow Highlight indicates the highest concentration in the Th-232 decay chain

Pink Highlight indicates the highest concentration in the U-238 decay chain



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Attachment E: PRG Input Parameters Specific to 738 Upper Mountain Road

Acceptable Cancer Risk	10 ⁻⁴ (1 in 10,000 risk of getting cancer)
Total Time for the Residence Living on Site	26 years
Total Time Exposed to the Contaminant	26 years
Total Hours per Day Exposed to Contaminant	24 hours per day
Total Hours per day an adult is exposed to Contaminant	24 hours per day
Total Hours per Day a Child is Exposed to Contaminant	24 hours per day
Total Hours per Day Exposed Indoor to Contaminant	16.416 hour per day
Total Hours per Day exposed Outdoor to Contaminant	1.752 hour per day
Total Years a Child is Exposed to Contaminant	6 years
Total Years an Adult is Exposed to Contaminant	20 years
Total Days per year Exposed to Contaminant	350 days per year
Total Days per Year a Child is Exposed to Contaminant	350 days per year
Total Days per Year an Adult is Exposed to Contaminant	350 days per year
Total volume of Soil Adult Intakes per Day	0.000001 milligrams per day
Total volume of Soil a Child Intakes per Day	0.000001 milligrams per day
Total volume of Soil/Dust an Adult Inhales per Day	20 cubic milligrams per day
Total volume of Soil/Dust a Child Intakes per Day	10 cubic milligrams per day
Percent of Building Foundation Shielding	40%
Area of Contamination	100 square meters
Clean Cover Thickness of Outdoor Soil	0 centimeters
Clean Cover Thickness Underneath Foundation of Building	0 centimeters
City (Climate Zone)	Harrisburg, PA Climate
Total Acres of the Property	1 acre
Particulate Emission Factor	3.19421E+11 cubic meters per kilogram
Percent Vegetation Found on Site	90%
Mean Annual Wind Speed	3.44 meters per second



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Attachment F:

PRG Output of the Risk Values for each Radionuclides in each of the decay chains

Th-232 Decay Chain:

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Ac-228	5.59E-19	3.13E-16	3.25E-07	7.41E-16	3.25E-07
Bi-212	3.13E-20	1.18E-16	6.52E-09	2.54E-15	6.52E-09
Pb-212	1.24E-17	6.92E-15	5.95E-08	1.67E-13	5.95E-08
Po-212	-	-	-	-	-
Po-216	-	-	3.71E-17	-	3.71E-17
Ra-224	6.90E-16	1.03E-12	3.85E-08	1.19E-11	3.85E-08
Ra-228	1.76E-12	2.18E-09	2.93E-08	3.90E-08	7.05E-08
Rn-220	-	1.84E-20	5.57E-13	-	5.57E-13
Th-228	7.52E-14	2.29E-09	1.23E-06	8.62E-11	1.24E-06
Th-232	5.36E-13	7.07E-09	9.39E-07	7.31E-10	9.46E-07
Tl-208	-	-	1.26E-08	-	1.26E-08
*Total Risk	2.37E-12	1.15E-08	2.64E-06	3.99E-08	2.69E-06

U-238 Decay Chain:

Isotope	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
At-218	-	-	2.06E-17	-	2.06E-17
Bi-210	6.03E-18	6.40E-15	4.51E-10	4.41E-13	4.52E-10
Bi-214	2.79E-22	2.39E-18	3.68E-09	2.48E-17	3.68E-09
Hg-206	-	-	9.13E-11	-	9.13E-11
Pa-234	7.50E-20	9.38E-19	6.46E-08	6.05E-16	6.46E-08
Pa-234m	-	-	2.61E-12	-	2.61E-12
Pb-210	3.87E-13	2.00E-10	2.41E-07	6.31E-09	2.47E-07
Pb-214	7.38E-22	4.05E-18	6.33E-10	1.07E-17	6.33E-10
Po-210	2.27E-14	5.63E-12	2.19E-10	4.51E-11	2.70E-10
Po-214	-	-	2.57E-20	-	2.57E-20
Po-218	-	8.39E-20	6.37E-19	-	7.21E-19
Ra-226	2.22E-13	5.16E-10	4.88E-06	5.18E-09	4.88E-06
Rn-218	-	-	4.75E-17	-	4.75E-17
Rn-222	-	2.44E-17	2.32E-10	-	2.32E-10
Th-230	5.47E-14	6.28E-10	2.37E-07	7.39E-11	2.37E-07
Th-234	7.54E-17	2.08E-15	1.37E-08	7.71E-14	1.37E-08
Tl-206	-	-	5.77E-13	-	5.77E-13
Tl-210	-	-	4.36E-10	-	4.36E-10
U-234	4.88E-14	5.13E-10	7.89E-08	3.30E-10	7.97E-08
U-238	4.42E-14	4.36E-10	3.91E-08	2.99E-10	3.99E-08
*Total Risk	7.79E-13	2.30E-09	5.56E-06	1.22E-08	5.57E-06



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Attachment G:
PRG Output of the PRG Values

Th-232 Decay Chain:

Isotope	Ingestion PRG	Inhalation PRG	External Exposure PRG	Produce Consumption PRG	Total PRG
	TR=0.0001	TR=0.0001	TR=0.0001	TR=0.0001	TR=0.0001
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
Ac-228	5.79E+16	1.03E+14	9.95E+04	4.37E+13	9.95E+04
Bi-212	1.03E+18	2.75E+14	4.97E+06	1.28E+13	4.97E+06
Pb-212	2.61E+15	4.68E+12	5.44E+05	1.94E+11	5.44E+05
Po-212	-	-	-	-	-
Po-216	-	-	8.74E+14	-	8.74E+14
Ra-224	4.69E+13	3.15E+10	8.41E+05	2.72E+09	8.41E+05
Ra-228	1.84E+10	1.49E+07	1.10E+06	8.30E+05	4.59E+05
Rn-220	-	1.76E+18	5.82E+10	-	5.82E+10
Th-228	4.31E+11	1.41E+07	2.63E+04	3.76E+08	2.62E+04
Th-232	6.04E+10	4.58E+06	3.45E+04	4.43E+07	3.42E+04
Tl-208	-	-	2.56E+06	-	2.56E+06

U-238 Decay Chain:

Isotope	Ingestion PRG	Inhalation PRG	External Exposure PRG	Produce Consumption PRG	Total PRG
	TR=0.0001	TR=0.0001	TR=0.0001	TR=0.0001	TR=0.0001
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
At-218	-	-	1.78E+14	-	1.78E+14
Bi-210	6.07E+14	5.72E+11	8.10E+06	8.30E+09	8.09E+06
Bi-214	1.31E+19	1.53E+15	9.95E+05	1.48E+14	9.95E+05
Hg-206	-	-	4.00E+07	-	4.00E+07
Pa-234	4.88E+16	3.90E+15	5.66E+04	6.04E+12	5.66E+04
Pa-234m	-	-	1.40E+09	-	1.40E+09
Pb-210	9.45E+09	1.83E+07	1.52E+04	5.80E+05	1.48E+04
Pb-214	4.96E+18	9.02E+14	5.78E+06	3.41E+14	5.78E+06
Po-210	1.61E+11	6.50E+08	1.67E+07	8.11E+07	1.35E+07
Po-214	-	-	1.42E+17	-	1.42E+17
Po-218	-	4.36E+16	5.74E+15	-	5.07E+15
Ra-226	1.65E+10	7.09E+06	7.50E+02	7.06E+05	7.49E+02
Rn-218	-	-	7.70E+13	-	7.70E+13
Rn-222	-	1.50E+14	1.58E+07	-	1.58E+07
Th-230	6.69E+10	5.82E+06	1.55E+04	4.95E+07	1.54E+04
Th-234	4.85E+13	1.76E+12	2.67E+05	4.74E+10	2.67E+05
Tl-206	-	-	6.33E+09	-	6.33E+09
Tl-210	-	-	8.39E+06	-	8.39E+06
U-234	7.49E+10	7.13E+06	4.64E+04	1.11E+07	4.59E+04
U-238	8.27E+10	8.39E+06	9.35E+04	1.22E+07	9.18E+04



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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL RESPONSE TEAM - WEST
4220 S. MARYLAND PARKWAY
BUILDING D, SUITE 800
LAS VEGAS, NEVADA 89119**



Attachment H:

Risk Assessment of 738 Upper Mountain Road for Removal Action

November 13, 2017

MEMORANDUM

SUBJECT: Risk Assessment of 738 Upper Mountain Road for Removal Action

FROM: Lyndsey Nguyen
Health Physicist, Environmental Response Team-West (ERT-W)

TO: Region II, 738 Upper Mountain Road Site (Site) Files
Attn: Eric M. Daly, On-Scene Coordinator (OSC), Region II

Risk Determination Process

An evaluation of 738 Upper Mountain Road Site was conducted to determine if the risk due to radioactive waste on the property warranted the need for USEPA to perform a removal action. The process for calculating the risk is by using USEPA's Preliminary Remediation Goal (PRG) Calculator. This calculator takes into account site specific parameters in determining a tailored risk specific to the property. Input parameters into the calculations must be site specific in order to determine the specific risk to people on the property. Input parameters include, but not limited to:

- Contaminant of concern (i.e. radionuclides of interest such as Radium-226)
- Concentrations of the contaminants (i.e. how radioactive is this contaminants—usually expressed in pico Curies per gram, or “pCi/g”)
- Area of contamination (i.e. how wide spread does the contamination extend)
- Depth of contamination (i.e. how deep into the ground does it extend), and the
- Scenario for the property usage (e.g. is the property residential, worker/construction site, recreational use, etc.)

Once these site specific parameters have been determined, these parameters are used in the PRG Calculator to determine two outputs:

1. “Risk”—The risk output represents the risk to the site “as is” before any cleanup is conducted. The risk determines if the site is in the acceptable risk range or if removal is warranted. For USEPA, the acceptable risk range is 10^{-6} to 10^{-4} .
2. “PRG Value”—The PRG value is the maximum soil concentration of radionuclides in order to be within the EPA established acceptable risk range. In general, the PRG value tends to be the cleanup value.



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These two outputs of risk and PRG values should be looked at jointly for the determination if removal action is warranted.

Site Risk Determination

To begin the PRG Calculations for 738 Upper Mountain Road, the input parameters for the property is needed. Assessment of 738 Upper Mountain Road Site was conducted which consisted of a qualitative measurements showing the extent of contamination (i.e. how far the contamination extends) and the intensity of contamination (i.e. where the highest concentrations are located). Attachment B shows the qualitative measurements which were performed using 3"x3" Sodium Iodide (NaI) detector scanning over the top of the area. This is commonly referred to as a "gamma scan" since the detector only detects gamma radiation given off of the source of contamination. The qualitative gamma scan is used to obtain a big-picture idea of the overall contamination on site.

To quantify the contamination, soil samples are performed from the surface to 4 feet in 6 inch increments. Sampling gives true measurements of the contamination concentrations, as well as determines how far below the soil surface does the contaminant extend. Sampling results are given in units of pCi/g. These results are the true, quantitative measurement of the contaminant. Attachment C shows the locations for the soil sampling. Qualitative and quantitative measurements must be performed in correlation with each other. A site cannot have only qualitative measurements without ground-truthing the measurements with quantitative soil samples. In addition, quantitative soil samples cannot be conducted unless a qualitative gamma scan has been performed to determine where the high intensity of contamination is located. In general, risk assessments are performed conservatively on the highest concentration on site. The highest concentrations for each radionuclide are outlined in Attachment D.

Calculation Assumptions

The PRG Calculations were performed for 738 Upper Mountain Road. The assumptions for the calculations can be found in Attachment E. The overall scenario for the risk calculation included both adult and children living on and near the contaminant. Since the contamination is located near the road, the possibility for growing food in the contamination was reduced to almost zero (i.e. 0.000001). The assumption is that the child and adult lives on the property for 26 years where the child spends 6 years on-site and the adult spends 20 years. For conservativeness, the child becomes the adult after 6 years and continues to live on the site for 20 more years. Both adult and child spend 24 hours per day for 350 days per year exposed to the contaminant. This is not a realistic scenario for property use and resident exposure (A child and adult would not spend 24 hours per day at the end of an outside driveway). This risk assessment assumes that the house is built on top of the contaminant which it is not. For conservativeness, these assumptions were made for a worst case scenario. The child inhales 10 mg³/day and the adult inhales 20 mg³/day of soil. The highest concentration of 323.580pCi/g of Thorium-232 and 36.575pCi/g of Uranium-238 was used for the contaminant. The calculator assumes that this contaminant is homogenous over 100m² at the surface—no asphalt, soil, nor gravel was taken into account to prevent a decrease in exposure. In addition, the scenario assumes the contamination is under the dwelling structure. The climate zone selected for the calculations were Harrisburg, PA. Lastly, the property size was estimated to be one acre with 90% vegetation.



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Conclusion

The assumptions listed in Attachment E were inputted into the PRG Calculator. The output of the calculation can be found in Attachment F showing the risk of the property as is, before any removal/remediation actions. Attachment G shows the PRG values which are the maximum amount of concentration acceptable based on USEPA risk range. In Attachment F, the risk for all progenies of Th-232 (i.e. the right most column in table) is less than 1×10^{-4} . In addition, if the risk for the progenies are added, the total risk for the entire decay chain of Th-232 is 2.69×10^{-6} which is less than 1×10^{-4} . There is no risk to Th-232, nor its progenies, at the concentrations located at 738 Upper Mountain Road. Also, the risk for all progenies of U-238 (i.e. the right most column in the table) is less than 1×10^{-4} . In addition, if the risk for the progenies are added, the total risk for the entire decay chain of U-238 is 5.57×10^{-6} which is less than 1×10^{-4} . There is no risk to U-238, nor its progenies, at the concentrations located at 738 Upper Mountain Road. The total risk of both Th-232 and U-238 can be added to give a total risk for both of the parent and progeny of 8.26×10^{-6} . Again, the risk is well below 1×10^{-4} of our target acceptable risk.

The maximum concentrations allowed at 738 Upper Mountain Road can be seen in Attachment G in the right most column. If we look at both the parent and progenies of Th-232 and U-238, the most limiting radionuclide appears to be Radium-226 in the Uranium decay chain and Th-228 in the Th-232 decay chain. To be in the acceptable risk range below 1×10^{-4} , all radionuclide concentrations for U-238 and its progenies must be less than 749 pCi/g, and all radionuclide concentrations for Th-232 and its progenies must be less than 26,200 pCi/g. Based on the risk calculations and the concentrations found at 738 Upper Mountain Road, no removal action is warranted. Risk assessment results for 738 Upper Mountain Road are within USEPA's acceptable risk range of 10^{-6} to 10^{-4} .